



# Southeast Texas Severe Weather Awareness Week

February 29 - March 6, 2004



## ...GOVERNOR PERRY DESIGNATES SEVERE WEATHER AWARENESS WEEK IN TEXAS...



Governor Rick Perry has proclaimed the week of February 29 through March 6 as Severe Weather Awareness Week in Texas. In an official proclamation, he reminded Texans of the threat to life that severe thunderstorms and tornadoes pose, and stressed that no part of Texas is immune to them. Governor Perry urged local officials to work with schools, libraries, the media and civic groups to disseminate awareness information and help prepare Texans for the coming severe weather season.

Spring marks the time of year when severe thunderstorms and tornadoes occur most often in Texas. They bring all the devastating elements - tornadoes, lightning, large hail, damaging winds and flash flooding. This is a time when Texans begin to take increasing advantage of the state's great outdoor opportunities. So, it is particularly important that everyone be aware of the weather when outdoors. Each Texan must know what to do when severe weather threatens him or her at home, at work, at school, at play or even when traveling on the road. Severe Weather Awareness Week is an excellent time to review safety plans for the coming weather threats.

This booklet is designed to serve as a guide to the dangers of severe weather and its impacts on southeast Texas, and to serve as a guide to community groups around southeast Texas. While reading this booklet, it is important to remember that severe weather can occur in any month of the year in southeast Texas.

You are encouraged to reproduce this booklet locally for further distribution.

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## Southeast Texas Tornado Drill

As a part of the Southeast Texas Severe Weather Awareness Week, a tornado drill will be conducted on Tuesday, March 2, 2004. If there is a threat of actual severe weather on that day, the drill will be postponed until Wednesday, March 3, 2004.



(NWS Houston/Galveston)

The purpose of the drill is to give citizens of southeast Texas a chance to determine if they can receive a warning, and what to do when a warning is received or a tornado is occurring. Every citizen is urged to participate by considering the protective actions that should be taken during a real tornado warning. A large portion of the population of southeast Texas are in school during weekdays. When the tornado warning for the drill is issued, schools throughout Southeast Texas are encouraged to participate by conducting a tornado drill and putting their severe weather

emergency preparedness plan into effect. This will give school administrators and safety officers an opportunity to see how effective their preparedness plan actually is. If your school does not have a severe weather preparedness plan, contact your county's director of emergency management or the Houston/Galveston National Weather Service.

Here are the plans for the drill:

1. At approximately **10:00 am**, a practice [Tornado Warning](#) will be issued by the Houston/Galveston NWS. The warning will be in effect for all 23 counties and all warning systems will be asked to activate just as if the tornado warning was real. The NWS will request activation of the Emergency Alert System (EAS) and will also sound the alert on their NOAA Weather Radio stations. All radio and television stations are urged to broadcast the practice tornado warning message. The warning will be in effect for 15 minutes.
2. At approximately **10:15 am**, a [Severe Weather Statement](#) will be issued to cancel the Tornado Warning. This will signify the end of the drill.

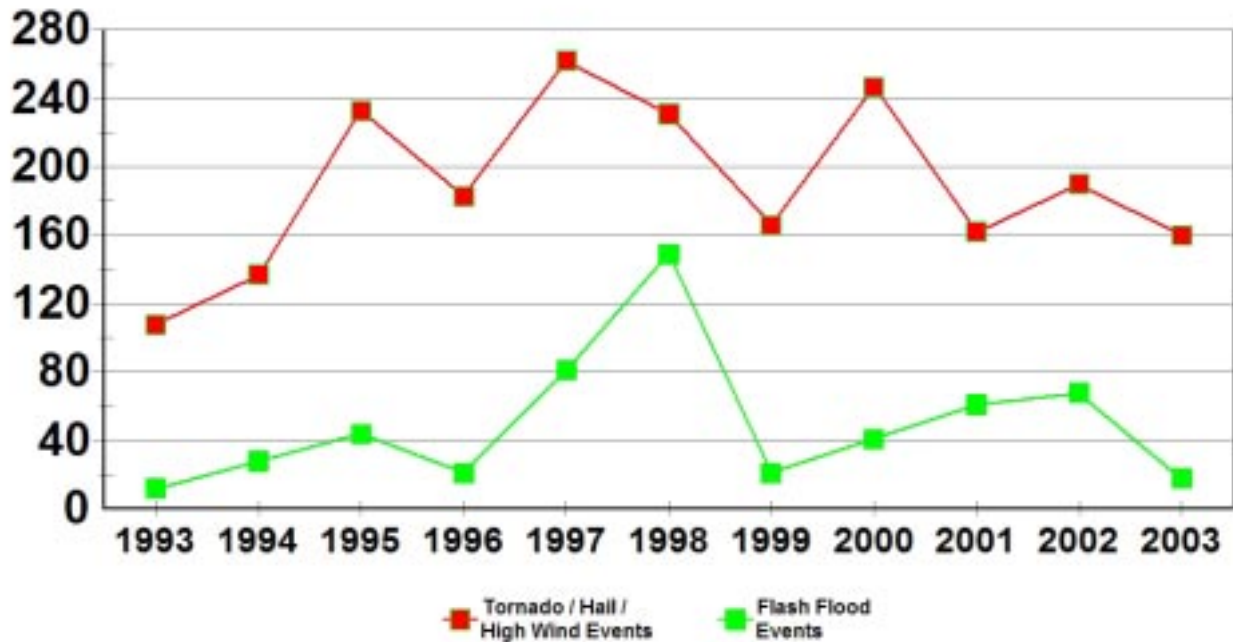
Schools that participate with a tornado drill should activate their emergency procedures when they receive the Tornado Warning. Once all of the preparedness actions have been taken and the students have been moved to your prearranged shelter locations, you can consider that the drill is over for your school.

Feedback after the drill is very important. Information about the public's ability to hear the warning is needed in order to evaluate the effectiveness of our tornado warning communication system. Please fill out the evaluation form and relay your comments to your county emergency management or the Houston/Galveston NWS.



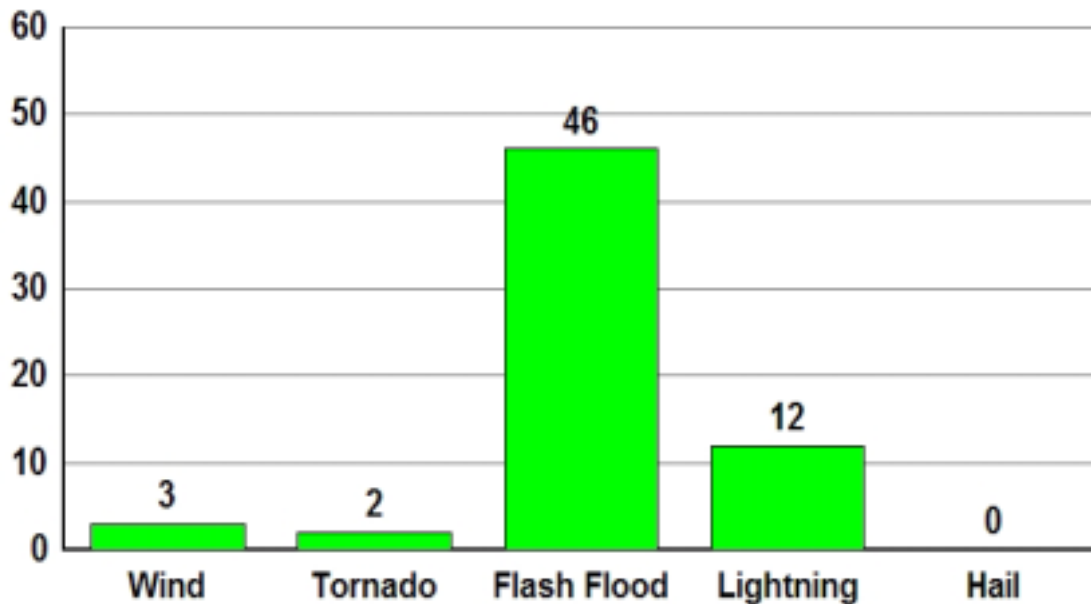
## Southeast Texas Weather Events

Jan 1993 - Oct 2003



## Weather Related Deaths

Jan 1993 - Oct 2003





## FLOODS AND FLASH FLOODS

### What are different types of floods?

#### Flash Floods

Flash floods are short-fuse weather events, typically lasting on the order of 6 hours or less. Usually, flash floods occur within a few minutes or hours following an excessive rainfall event. They can also be caused by a man-made event, such as a dam or levee failure. Flash floods cause most of the fatalities associated with flooding events. Usually, less warning lead time is provided for flash flooding which requires quick action on the part of the public.

#### Urban Floods

Flash flooding is most severe in urban areas like the Houston metropolitan area. Urbanization increases runoff by 2 to 6 times over what would occur in natural terrain. Flood waters can fill streets, freeway underpasses, and parking lots and can sweep away cars.

#### River Floods

Heavy rainfall falling over a widespread area (such as a large portion of a watershed) over a prolonged period (up to several days) can cause river flooding. Typically, river flooding begins as a high crest on the upper part of a watershed that takes several days to move downstream. Due to the slow nature of river flooding, ample advanced warning is provided to evacuate people or property in the path of the flooding.



(Harris County Office of Emergency Management)

### How does flooding impact southeast Texas?

Flash flooding is a relatively common event over southeast Texas. Tropical systems during the summer and early fall, and strong winter storm systems can cause widespread flooding and flash flooding across the area. Flash flooding can also be produced by strong slow-moving thunderstorms especially during the spring and summer months. Flooding and flash flooding can occur anywhere in southeast

Texas, but is usually most severe near major watersheds like the Colorado, Brazos, San Jacinto or Trinity Rivers, and near urban centers like the Houston metropolitan area.



## **What are some recent major floods that have impacted southeast Texas?**

### **June 2001**

Tropical Storm Allison devastated a large portion of southeast Texas with an incredible amount of rain as she meandered around southeast Texas for over five days. Between the 5th and the 10th, much of Houston and the surrounding areas to the north, east and south received between 15 to 35 inches of rain which caused devastating flooding and flash flooding. The largest amount fell over a 6 to 12 hour period on the 8th and 9th resulting in 22 deaths in the Houston area. More than 48,000 homes were damaged (11,000 with major damage and 3,600 completely destroyed). More than 70,000 automobiles were flooded during the storm. In Harris County alone, an estimated 300 billion gallons of water fell. This amount was enough to fill the Astrodome more than 5,600 times! Allison ended up being the costliest tropical storm ever (>\$5 billion) for the state of Texas and for the United States.

### **September 1998**

Tropical Storm Frances made landfall along the upper Texas coast on September 11th. As the storm moved inland, widespread heavy rainfall occurred in the Houston metropolitan area. Rainfall amounts of up to 16 inches were reported in the downtown Houston area. Frances caused extensive flooding along White Oak Bayou and flooded several major roads and freeways in the Houston area.

### **October 17-21, 1994**

This was perhaps the worst flooding to impact such a large portion of southeast Texas on record. Lake Livingston recorded a record height on the 17th and a record flow of 110,000 cfs. Liberty recorded 30 inches of rainfall in less than 48 hours, and much of the city went underwater due to a failed levee system. Spring Creek and Lake Houston set new flood crest records. Several major highways into and out of Houston were flooded including I-45 north of Houston and US 59 northeast of Houston. Four fuel pipelines ruptured on the San Jacinto River, causing a massive fuel spill and widespread fires. An estimated 22,000 homes were flooded across southeast Texas during this event, with \$900 million in damage reported. Seventeen fatalities resulted from the floods.

### **March 3-4, 1992**

Heavy rainfall associated with a stationary line of thunderstorms produced major flash flooding in the metro Houston area. Both I-10 and I-45 near White Oak Bayou were covered with several feet of water bringing traffic to a standstill for several hours. An estimated 2000 homes and 4000 automobiles were flooded. One fatality was attributed to the storm.





## National Weather Service Flood Products:

- **FLOOD WATCH**  
Means that conditions in the watch area will be favorable for flooding during the specified period. Usually heavy rainfall is expected following a long period of wet weather.
- **FLASH FLOOD WARNING**  
Flash flooding is reported or is imminent in the counties specified in the warning. Take immediate precautions.
- **URBAN AND SMALL STREAM FLOOD ADVISORY**  
Flooding of streets, low-lying areas like underpasses and storm drains, and small streams is expected. Caution should be taken while traveling.
- **FLASH FLOOD STATEMENT**  
Follow-up information on a Flash Flood Watch or Warning.
- **RIVER FLOOD OUTLOOK**  
Indicates potential for flooding along rivers and streams.



(NWS Jackson)

### What do you do in flash flood situations?

The worst place to be in a flash flood is traveling by car. **TWO FEET** of water will carry away most automobiles. Do not cross water flowing over a roadway if you do not know its depth.

### What do you do when a **FLOOD WARNING** is issued or flooding is imminent?

If advised to evacuate, do so immediately!!

Move to a safe area...not cut off by flood waters.

Avoid areas you know are subject to flooding.

Do NOT attempt to drive over a flooded roadway. Do not drive into barricaded areas, **the barricades are there for a reason!**

Children should never play around storm drains, creeks, streams, or rivers, or in flooded streets.



## Things you can do ahead of time to prepare for major floods:

Know the flood risk at your place of home or business and its elevation above flood stage.

Store drinking water in clean bathtubs or containers. This is very important as flood waters will contaminate the drinking water supply in your area.

Stock non-perishable food items requiring little cooking and no refrigeration.

Keep first aid supplies on hand.

Keep NOAA Weather Radio, battery-powered portable radio, emergency cooking equipment, and flashlights in working order.

Install check valves in sewer traps to prevent flood waters from backing into your home.

## Flood disaster supply kit:

first aid kit	canned food/can opener	bottled water
rubber boots	NOAA Weather Radio	battery-powered radio
flashlight	batteries	gloves

## What do you do after the flood has passed?

Boil drinking water before using. Do not use tap water without boiling it!

Seek necessary medical care at the nearest hospital. Clothing, food, and shelter are available at the nearest Red Cross.

Do not visit disaster areas. You may hamper rescue and emergency operations.

Electrical equipment should be checked or dried before being returned to service. Make sure to wear rubber gloves and rubber boots when working with electrical equipment.

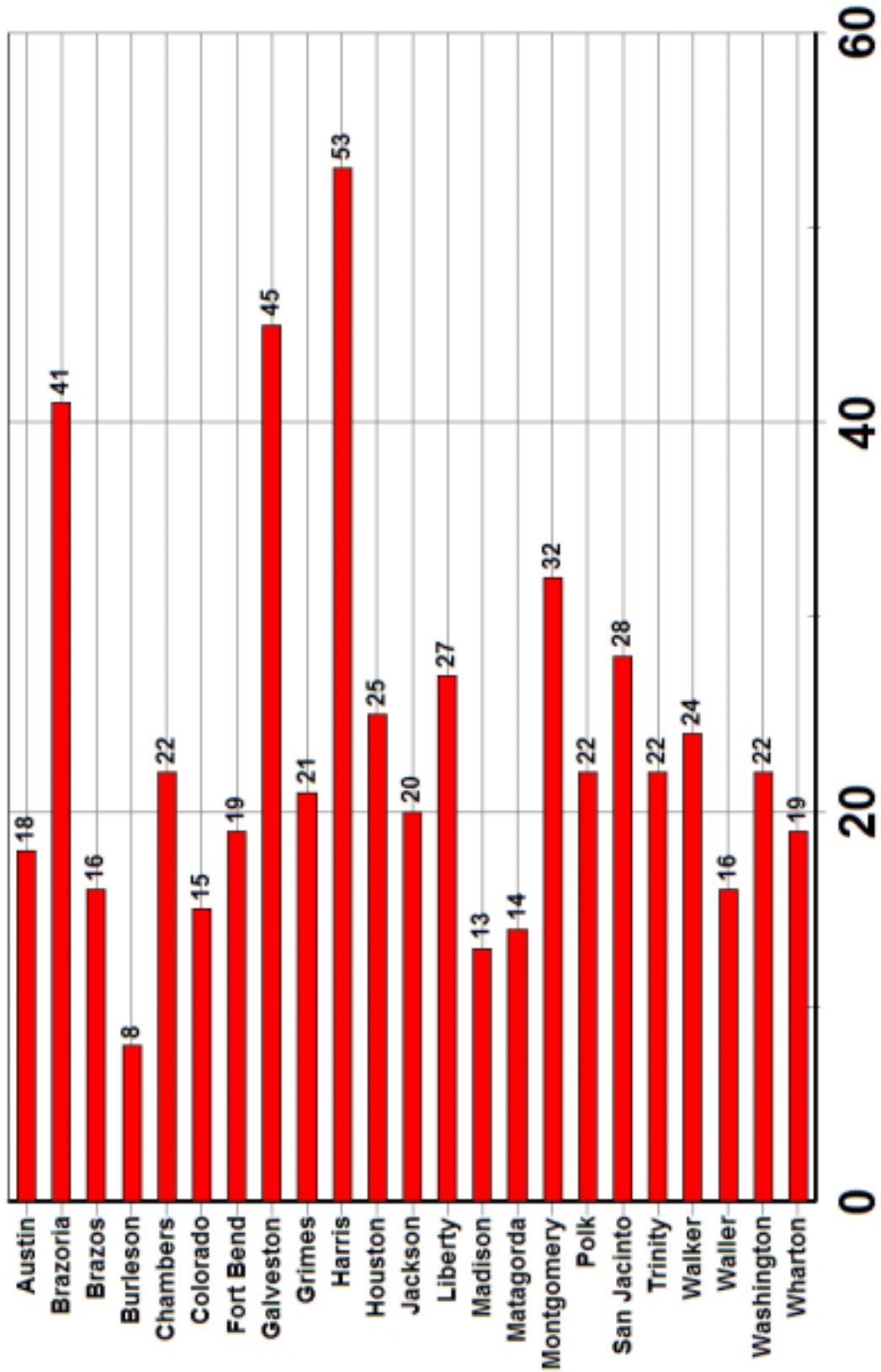
Report broken utility lines to the proper authorities.



(NWS)



## SE Texas Flash Flood Events Jan 1993 - Oct 2003



FLOODS/FLASH FLOODS





## SEVERE THUNDERSTORMS

### What classifies a “severe” thunderstorm?

A thunderstorm is classified as “severe” by the National Weather Service when it produces wind gusts in excess of 58 mph or hail of 3/4 inch in diameter or larger. An occurrence of a tornado will also classify a thunderstorm as severe.

### How do severe thunderstorms impact southeast Texas?



(Gene Rhoden)

While severe thunderstorms are most common in the spring and summer, they can occur just about any time of the year in southeast Texas. On average, southeast Texas experiences 50 to 60 days a year with thunderstorms. Severe thunderstorms occur on about a third of those days. Severe storms can occur just about any time of day in southeast Texas, but are most common in the afternoon and evening hours.

### Severe weather threats:

- **Downbursts**  
A downburst is a small area of rapidly descending air beneath a thunderstorm. Downburst winds are often referred to as “straight-line” winds. Severe downbursts produce wind gusts from 60 mph to more than 100 mph. The damage is often similar to damage from a weak tornado. Downburst damage is far more common in southeast Texas than tornado damage.
- **Large Hail**  
Hail is formed as strong rising currents of air within a storm (updrafts) carry water droplets to a height where freezing occurs. The ice particles travel upward and downward through the storm several times, growing in size. Once they become too heavy to be supported by the storm’s updraft, they fall to the ground as hail. Hail of 3/4 inch in diameter or larger classifies “large” or damaging hail. Hail sizes are usually given as references to everyday objects to make it easier to estimate hail size.
- **Tornadoes**  
Tornadoes are another threat from severe thunderstorms. See the Tornado section for more information.
- **Cloud-to-Ground Lightning**  
Severe thunderstorms can produce extremely dangerous lightning. See the Lightning section for more information.
- **Flash Flooding**  
Heavy rains from severe thunderstorms can produce flash flooding. See the Floods/Flash Floods section for more information.



Examples of Hail Size	
pea sized	0.25 inch
dime sized (classifies storm as severe)	0.75 inch
nickel sized	0.88 inch
quarter sized	1.00 inch
golfball sized	1.75 inch
baseball sized	2.75 inch



(NSSL)

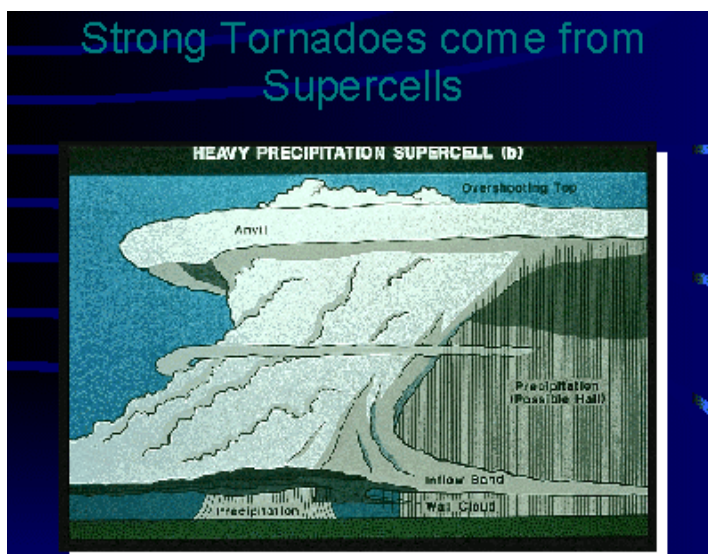
SEVERE THUNDERSTORMS

### What can you do to be prepared for severe weather?

**Know the county that you live in and the names of nearby major cities.** SEVERE THUNDERSTORM WARNINGS are issued on a county by county basis with the names of major cities highlighted in the warnings.

**Have a NOAA Weather Radio in your home and/or place of business.** Some receivers are specially built to alarm any time a severe weather Watch or Warning is issued by the National Weather Service.

**Make sure you are aware of the best spot in your home to take shelter from severe weather.** The most appropriate place is usually an interior room on the lowest floor of your home and away from windows. If you know severe weather is approaching or a SEVERE THUNDERSTORM WARNING is issued...seek shelter immediately!! Being in a sturdy building on the lowest floor and away from windows is the only safe place in a severe thunderstorm!! Automobiles, boats, or out in the open are not safe places in severe thunderstorms.



(NOAA)



## **What were some recent severe weather events that have impacted southeast Texas?**

### **December 23, 2002**

The combination of abundant low level moisture, a strong upper level storm system and a warm front helped to produce nearly fifty severe weather events across Southeast Texas, including tornadoes in Colorado, Burleson, Washington, Brazos, Grimes, Madison, Montgomery, and San Jacinto counties. Large hail (up to 1.75 inches) was observed mainly north and west of the Houston area. Locations from Houston to the beaches felt the brunt of this event in the evening when a squall line rapidly moved eastward across Harris County and toward the coast and produced 60 to 80 mph winds.

### **November 23-24, 2000**

Three tornadoes struck the Houston area on Thanksgiving night. An F1 tornado struck Katy, injuring one person, flipping over two office trailers, and damaging several homes. Pasadena was also struck by an F1 tornado which damaged a church and two schools, several homes in a neighborhood, and tore the walls off of a strip shopping center. Another F0 tornado struck Conroe, downing trees and tearing the steeple off a church.

### **May 1-2, 2000**

A strong storm system produced widespread severe thunderstorms over the southern half of southeast Texas. Widespread wind damage impacted Harris, Fort Bend, Wharton, Brazoria and Galveston counties. The worst damage occurred at Clover Field in Pearland where several planes were overturned and two airplane hangars were destroyed. At Scholes Field in Galveston, several small planes were also overturned and the NOAA P-3 research aircraft was damaged. A massive hailstorm with baseball-sized hail struck Conroe producing over \$10 million in damage.

### **August 31, 1999**

A bow echo (a band of thunderstorms producing damaging winds) moved across the Houston area. Widespread wind damage occurred with numerous reports of trees down, windows blown out of buildings, and damage to rooftops and automobiles. A motel under construction in southwest Houston collapsed. Wind gusts were estimated up to 70 mph.

### **April 20, 1995**

A supercell thunderstorm produced baseball to grapefruit size hail and an F0 tornado east of downtown Houston to the La Porte and Channelview areas. Two garages were destroyed and large tree limbs and fences were downed.



## National Weather Service Severe Thunderstorm Products:

- **HAZARDOUS WEATHER OUTLOOK**

Issued by the local National Weather Service office daily at 7 am. Usually covers a large portion of southeast Texas. Outlines the reasons for the potential for severe weather, the area that could be affected, and the time that severe weather is anticipated.

- **SEVERE THUNDERSTORM WATCH**

Issued by the Storm Prediction Center in Norman, OK. Usually covers a large area (such as all or a portion of southeast Texas) and lasts for 6 to 8 hours. A SEVERE THUNDERSTORM WATCH means that conditions are favorable for severe thunderstorms that may produce large hail, damaging wind, dangerous lightning, or possibly tornadoes.

- **SEVERE THUNDERSTORM WARNING**

Issued by the local National Weather Service office. Usually covers a small area (one or a few counties) and has a short duration of 30 minutes to an hour. A SEVERE THUNDERSTORM WARNING means that a severe thunderstorm has been detected by radar, or reports of severe weather have been received by the National Weather Service in the area covered by the warning. The warnings are broadcast over NOAA Weather Radio and are usually scrolled on local television stations. The warnings are also relayed to local emergency management and public safety officials who can activate emergency procedures to help protect the public. If a warning is issued for your area, take action immediately!!

- **SEVERE WEATHER STATEMENT**

Follow-up information on a WARNING.

## SEVERE THUNDERSTORMS

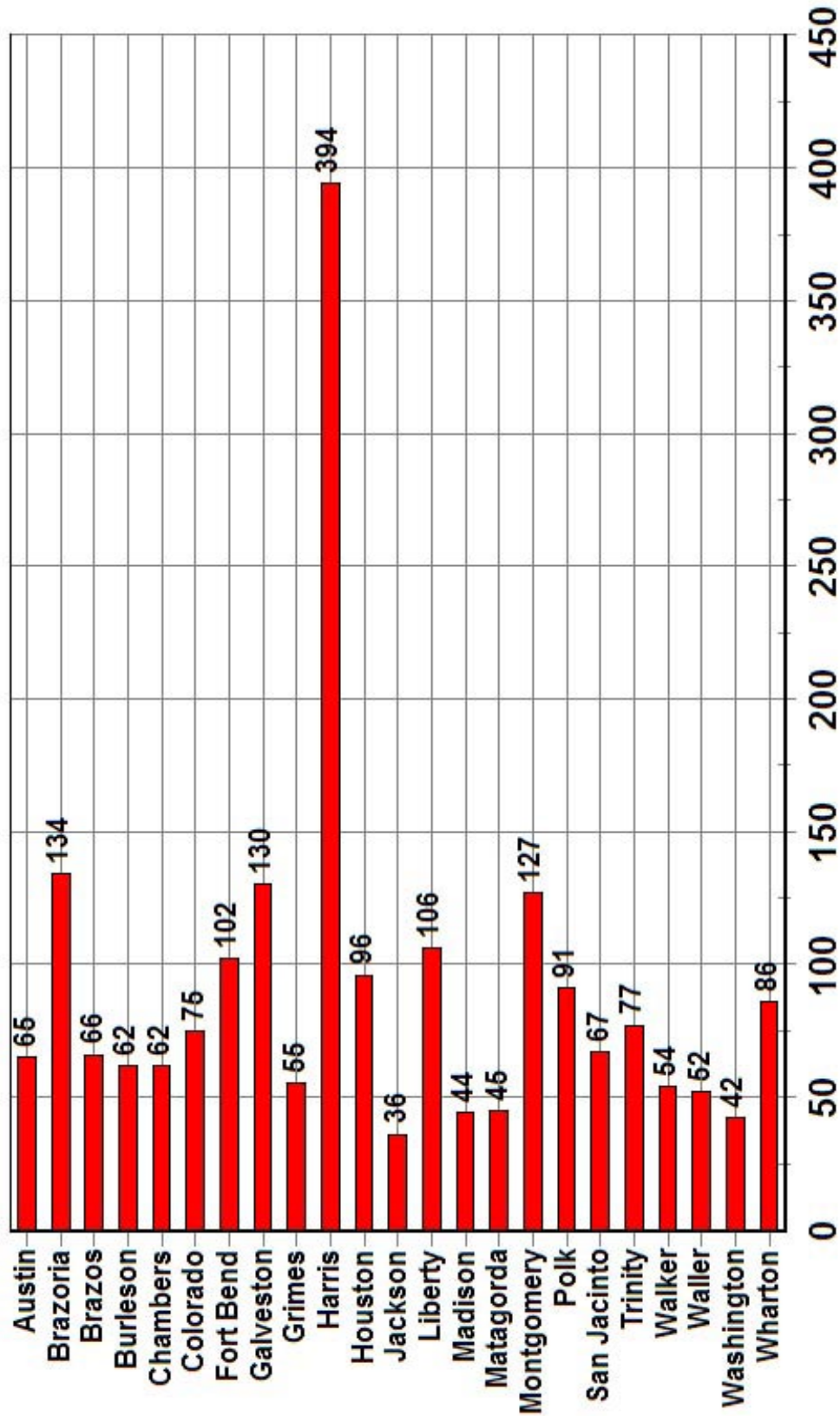


(TSSN)



# SE Texas Severe Weather Reports

Jan 1993 - Oct 2003



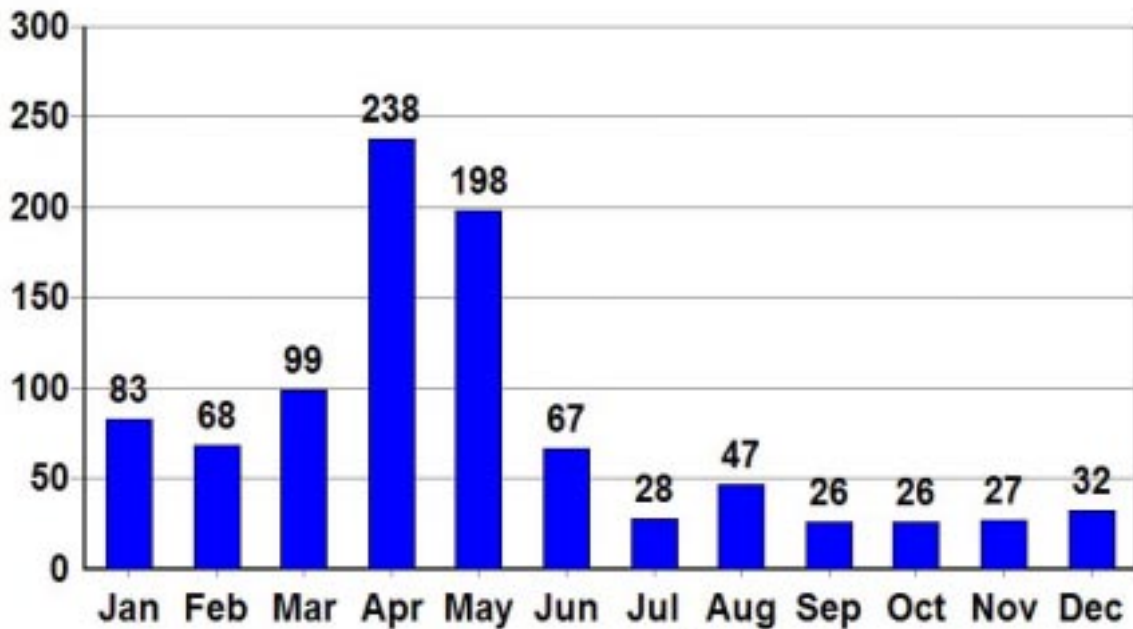
SEVERE THUNDERSTORMS



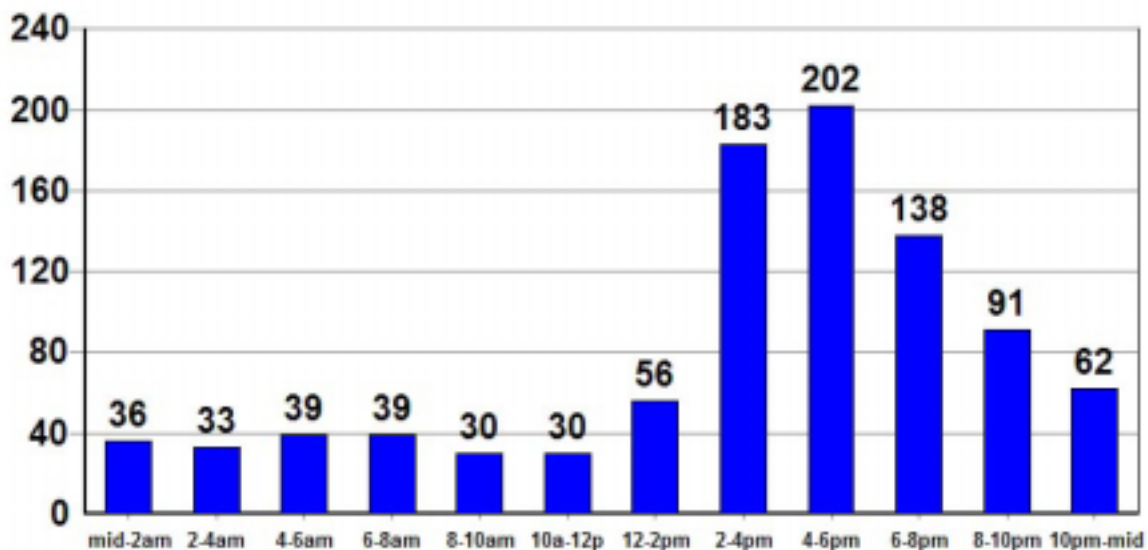


## Southeast Texas Hail Statistics

### Hail Events Jan 1993 - Oct 2003



### Time of Hail Events Jan 1993 - Oct 2003



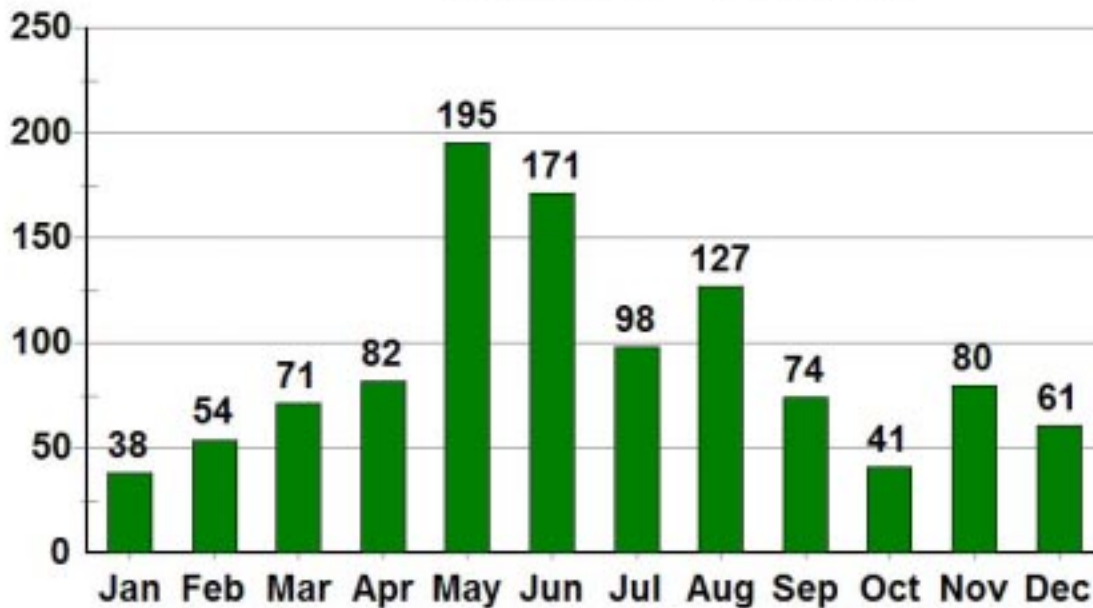
SEVERE THUNDERSTORMS



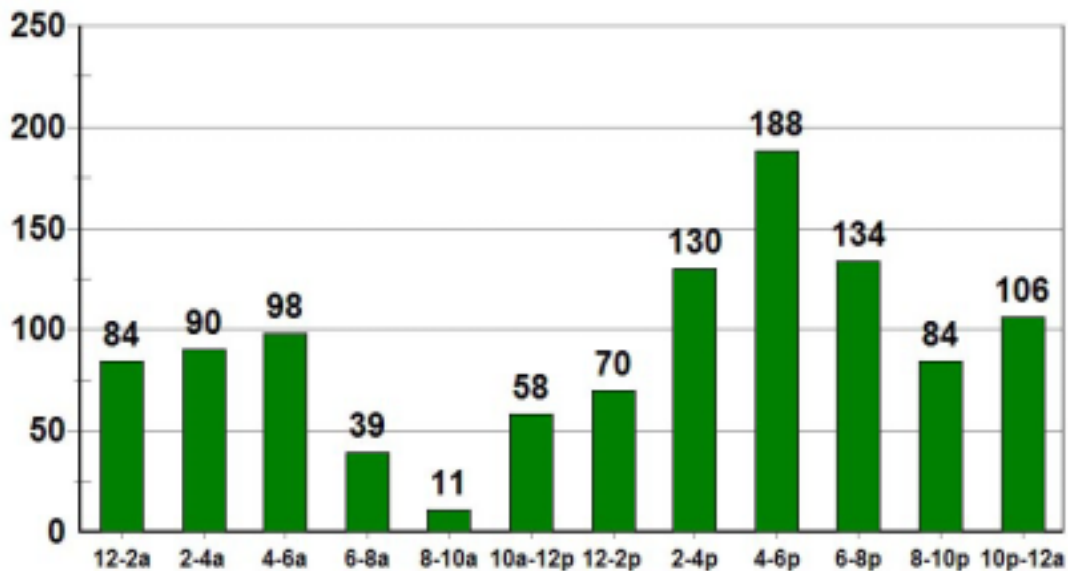


## Southeast Texas High Wind Statistics

### Thunderstorm Wind Events Jan 1993 - Oct 2003



### Time of Thunderstorm Wind Events Jan 1993 - Oct 2003



SEVERE THUNDERSTORMS



## TORNADOES

(NSSL)



### What causes tornadoes?

Tornadoes most commonly form from large-scale storm systems that traverse the U.S. from west to east. Typically, severe thunderstorms will develop in the warm, moist airmass ahead of the storm system, and can produce tornadoes. Tornadoes can result from isolated thunderstorms or as part of a large squall line that forms along a cold front. Severe thunderstorms and tornadoes need an unstable (warm, humid) airmass, cold air at mid-levels of the atmosphere, and strong wind shear (turning and strengthening of winds with height in the

atmosphere) to develop. In a thunderstorm, the tornado begins as a circulation several thousand feet above the ground, and slowly descends to the ground.

Organized tropical systems like tropical storms and hurricanes can also produce tornadoes, but usually smaller and shorter-lived than those spawned by mid-latitude systems.

### How do tornadoes impact southeast Texas?

Texas averages 137 tornadoes each year, the highest number of any state in the U.S. Tornadoes are most common during the spring and summer months nationwide, but due to our proximity to the Gulf of Mexico as a moisture source, tornadoes can occur in southeast Texas any time of year. In fact, some of our worst tornado outbreaks on record in southeast Texas have actually occurred in the late fall and winter months. Strong to violent tornadoes (those F2 or larger) are fairly uncommon, but they can occur. Tornadoes are usually isolated incidences, but occasionally can occur in "outbreaks" of several in one day.

### What is a waterspout?

Waterspouts are weak tornadoes that form over water. Along the upper Texas coast they are most common during the morning hours of the summer months, and do not require a thunderstorm to be present to form. Usually, waterspouts are short-lived, do little if any damage, and have winds well under 100 mph. On rare occasions, they can move inland as tornadoes and cause damage.



(Dr. Joseph Golden, NOAA)

TORNADOES



## How are tornadoes rated?

**Weak tornadoes** are generally those classified as F0 or F1 and comprise 69% of all tornadoes nationally and 93% of all tornadoes locally. In southeast Texas, these tornadoes typically last only a few minutes and produce winds less than 100 mph. Usually, they will cause only spotty minor damage, such as downing trees or power lines. Tornadoes in the F0 or F1 category contribute to less than 5% of tornado deaths annually.

**Strong tornadoes** are those classified as F2 or F3, with winds of 110 to 205 mph. They comprise 29% of all tornadoes nationally and account for nearly 30% of all tornado deaths across the entire U.S.. They may last 20 minutes or longer. Tornadoes of this magnitude are uncommon in southeast Texas, accounting for only 7% of all the tornadoes that have affected the area.

**Violent tornadoes**, those classified as F4 or F5, account for only 2% of all tornadoes nationwide. These tornadoes account for 70% of all tornado deaths nationally, and their lifetime can exceed 1 hour. Violent tornadoes have occurred in southeast Texas, but they are extremely rare. These tornadoes only account for less than 1% of all the tornadoes that have ever struck southeast Texas.

Tornado rating has nothing to do with the size of the tornado. Each tornado is rated after it touches down, based on the damage that it has done.

Fujita Wind Damage Scale		
NUMBER	WIND SPEED	DAMAGE
F0	Up to 72 mph	Light
F1	72 to 112 mph	Moderate
F2	113 to 157 mph	Considerable
F3	158 to 206 mph	Severe
F4	207 to 260 mph	Devastating
F5	261+ mph	Incredible



## What should a school do to prepare for a tornado?

1. Develop a severe weather action plan and conduct frequent drills. Children should kneel on the floor, putting their head on the ground and covering their neck with their hands. The neck and lower head are the most vulnerable parts of the body to flying debris.

2. Each school should be inspected and shelter areas designated by a registered engineer or architect. Schools without basements should use interior rooms and hallways on the lowest floor and away from windows.

3. Have a compressed airhorn or megaphone to activate the alarm in case of power failure.



(NWS Houston/Galveston)

4. Make special provisions for disabled students or those in trailers.  
5. Have someone on hand to turn off the gas or electricity if the school is damaged.  
6. Prepare to keep children at school beyond regular hours if threatening weather is expected. Children are safer in school than traveling on the roadways during severe weather. Students should NOT be sent home early if severe weather is approaching.  
7. Large, high rooms are dangerous when a tornado is approaching. Gymnasiums, cafeterias, and auditoriums offer no protection in a tornado. Other large facilities can take similar measures for tornado preparedness.

## What can you do ahead of time to prepare your home or business for a tornado threat?



(NWS Houston/Galveston)

- 1. Develop a plan for your family or coworkers at your place of residence or business.**
- 2. Do frequent tornado drills.**
- 3. Know the county where you live.** All National Weather Service warnings are issued by county.
- 4. Purchase a NOAA Weather Radio with a warning alarm and battery back-up.** It will automatically be activated when a warning is issued.

## What else can you do to prepare for a tornado?

- Remain alert for signs of an approaching tornado.
- Be aware of rapidly darkening skies.
- Listen for approaching strong winds or the sound of a freight train.
- Look for rotation in clouds or a "wall cloud," a distinct lowering from the back of a thunderstorm. In southeast Texas, hazy skies and tall trees make sighting tornadoes difficult. Also, tornadoes are often obscured by rain or can occur at night.



## National Weather Service Tornado Products:

- **TORNADO WATCH**

Issued by the Storm Prediction Center in Norman, Oklahoma. Usually covers a fairly large area (such as all or a portion of southeast Texas) and runs from 6 to 8 hours. A TORNADO WATCH is usually issued a few hours in advance of severe weather, and means conditions are favorable for severe thunderstorm development.

- **TORNADO WARNING**

Issued by your local National Weather Service office. Typically runs for a short time span, usually 30 minutes to 1 hour and covers a relatively small area of one to a few counties. Means a tornado has been sighted or a strong circulation has been detected by radar. If a TORNADO WARNING is issued for your area, seek shelter immediately!!

**Remember, tornadoes can occur even if a **TORNADO WATCH** or a **TORNADO WARNING** are not in effect!!**



(NWS Houston/Galveston)

**TORNADOES**

## What do you do when a tornado is approaching or a TORNADO WARNING is issued?

- 1) In a home or business, go to the safest place, usually on the lowest floor of the building in a central room away from windows. Get under a sturdy piece of furniture.
- 2) Stay away from windows.
- 3) Get out of automobiles immediately! They will become flying debris in a tornado. Do not try to outrun a tornado in your car.
- 4) If caught outside, lie flat in a nearby ditch or depression.
- 5) Abandon mobile homes. Even if tied down, they will offer no protection in a tornado.





## **What are some recent tornadoes and tornado outbreaks that have impacted southeast Texas?**

### **March 30, 2002**

An F3 tornado struck the La Porte area on this evening. The tornado began its path three miles south of La Porte and then moved northeast and partially demolished a mini mart and caused major roof damage to an apartment complex. The path of this tornado was 3/4 of a mile long.

### **January 1, 1999**

Here's proof that tornadoes can occur any time of year in southeast Texas. On New Year's Day 1999, nine tornadoes touched down over southeast Texas in association with a strong storm system that moved across the region. Two of the tornadoes were rated as F2. One of the tornadoes tracked 5 miles to the southeast of Trinity, damaging homes in several subdivisions. The other F2 impacted an area in Liberty County 10 miles east of Devers. Eight injuries were reported during this outbreak.

### **October 23, 1997**

An unseasonably strong storm system spawned 11 tornadoes around southeast Texas. Two F2 tornadoes were reported. One tornado tracked 12 miles from Lake Houston to western Liberty County. Another tornado tracked 25 miles through Montgomery and Liberty counties, resulting in major damage to several homes. An F1 tornado struck Sugar Land damaging 109 homes.

### **The November 1992 Outbreak**

Perhaps the worst tornado outbreak on record in southeast Texas occurred on November 21, 1992. Over a dozen tornadoes resulted from a powerful storm system moving across the area. Most of the tornadoes occurred during a two hour period during the early afternoon that day. Widespread damage occurred in the Houston area, with hundreds of homes and businesses affected. A total of 34 injuries and over \$12 million in damage resulted from this outbreak. Amazingly, there were no fatalities.

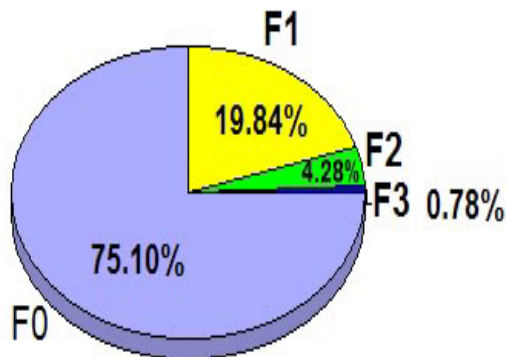
An F4 tornado struck Channelview, traveling on the ground 20 miles into Liberty County. This tornado resulted in 15 injuries, 200 homes destroyed, and 1000 homes damaged. An F3 tornado tracked from northeastern Harris County into Liberty County for a total of 28 miles. Two F2 tornadoes occurred in Harris County. One tornado tracked right through the middle of Houston, traveling from Hermann Park northward to near Intercontinental Airport damaging 600 buildings and injuring 6 people. Another tornado struck the Kelliwood subdivision in Katy causing significant home damage and injuring six. It then went on to hit the West Side Airport where it damaged a dozen aircraft.





## Southeast Texas Tornado Intensity

# Intensity of Tornadoes Jan 1993 - Oct 2003

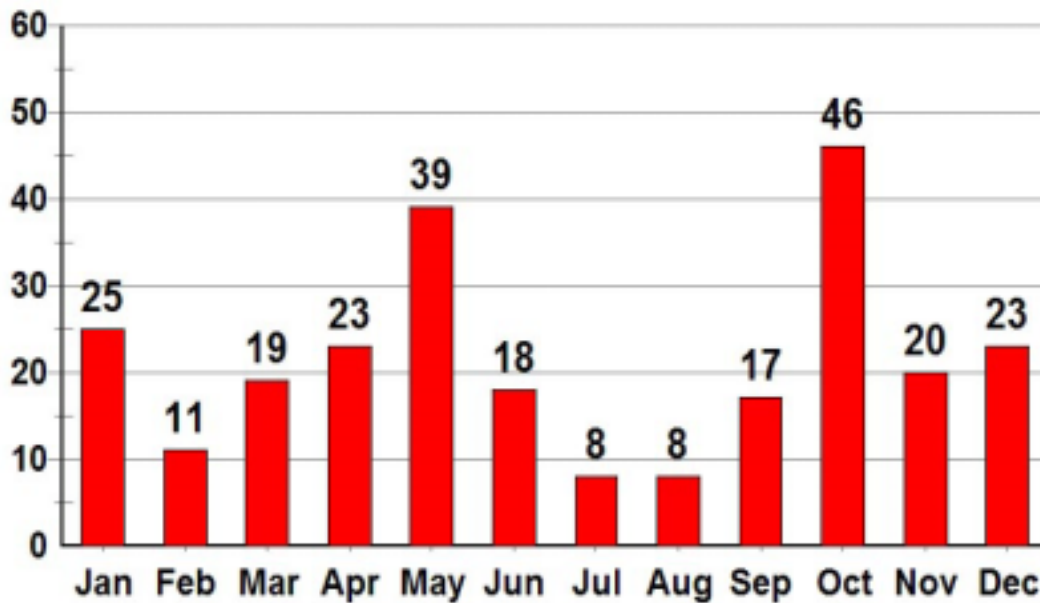


TORNADOES

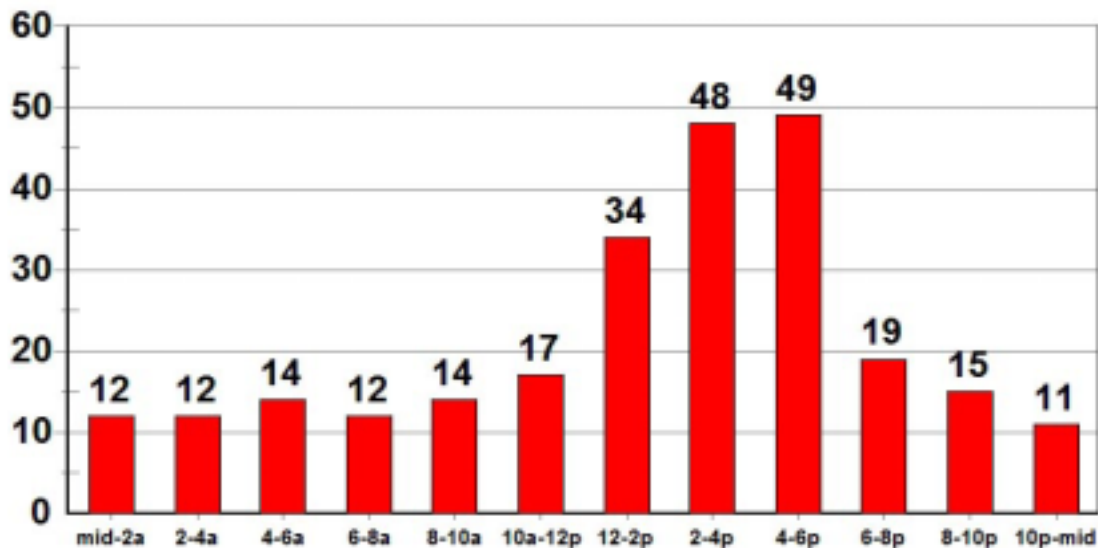


## Southeast Texas Tornado Statistics

### Tornadic Events Jan 1993 - Oct 2003



### Time of Tornadic Events Jan 1993 - Oct 2003



TORNADOES



## LIGHTNING



Lightning occurs with ALL thunderstorms. An average 93 deaths and 300 injuries occur around the U.S. annually. An estimated 100,000 thunderstorms occur nationwide each year. The southeast Texas area averages 50 to 60 days with thunderstorms per year.

Lightning results from the buildup and discharge of electrical energy between positive and negative charged areas. Most lightning deaths or injuries occur when people are on a golf course, near water, or standing under trees for shelter. The late afternoon or early evening hours during the summer are the most common times for lightning casualties nationwide, but they can occur just about any time of year near the Gulf coast. The Gulf coast region has the highest incidences of lightning strikes annually throughout the U.S.

Lightning can strike several miles away from a thunderstorm. If you know a thunderstorm is nearby or approaching, you should take shelter in a building and stay away from trees, metal objects and water. An automobile can be a relatively safe place when lightning occurs. Avoid using telephones and electrical appliances during a thunderstorm.

### If you are caught outside during a thunderstorm...

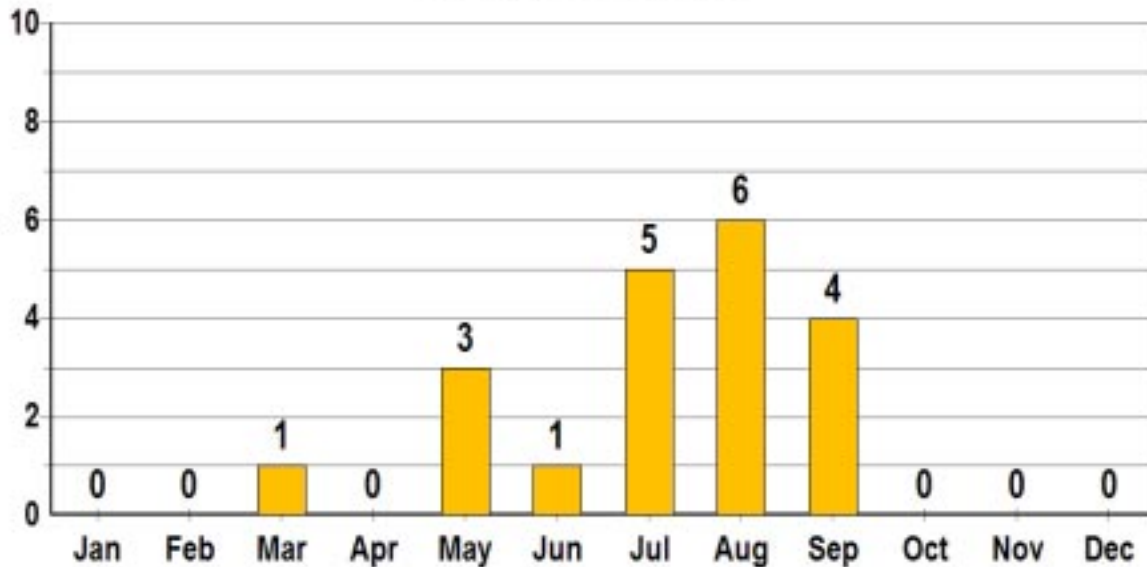
- If you feel your hair stand on end it means lightning is about the strike. Squat low to the ground on the balls of your feet. Place your hands on your knees with your head between them. Make yourself the smallest target and minimize contact with the ground.
- Stay away from trees and other tall objects. If you are in the woods, find the shortest trees to seek shelter underneath.
- Use the "30-30 Rule" while outside. The first 30 is the number of seconds between a flash of lightning and the time you hear thunder. This means the lightning is approximately 6 miles away (30 seconds divided by 5 seconds a mile). The second 30 refers to the number of minutes after the last flash of lightning or a clap of thunder to establish an all-clear.



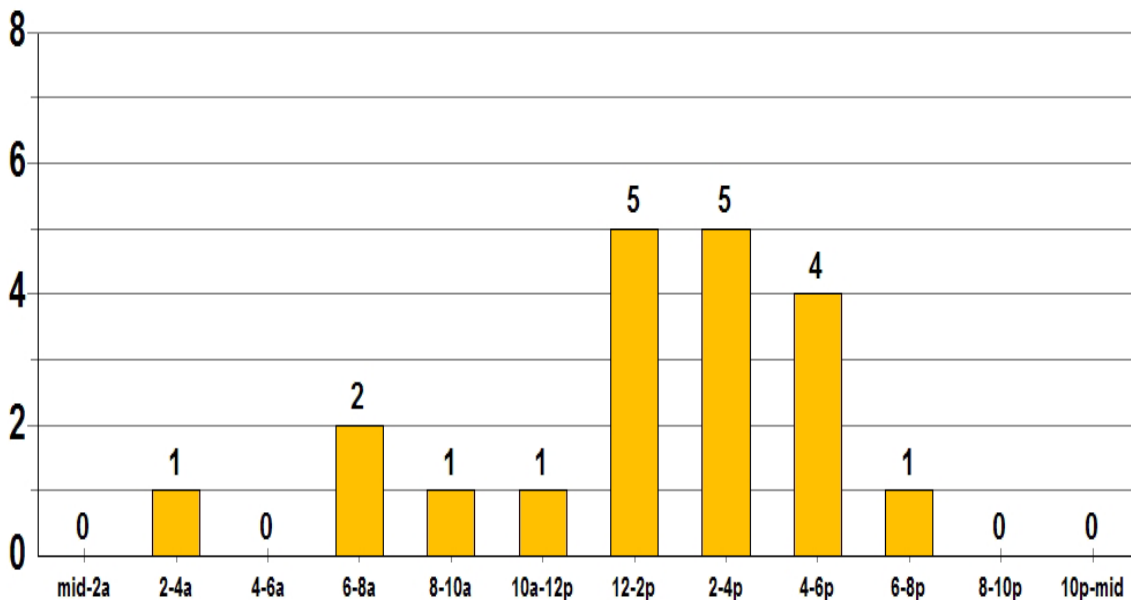


## Southeast Texas Lightning Statistics

Number of Days with Lightning Related Injury/Death  
Jan 1993 - Oct 2003



Time of Lightning Related Injury/Death  
Jan 1993 - Oct 2003



LIGHTNING



## NOAA WEATHER RADIO

### General Information

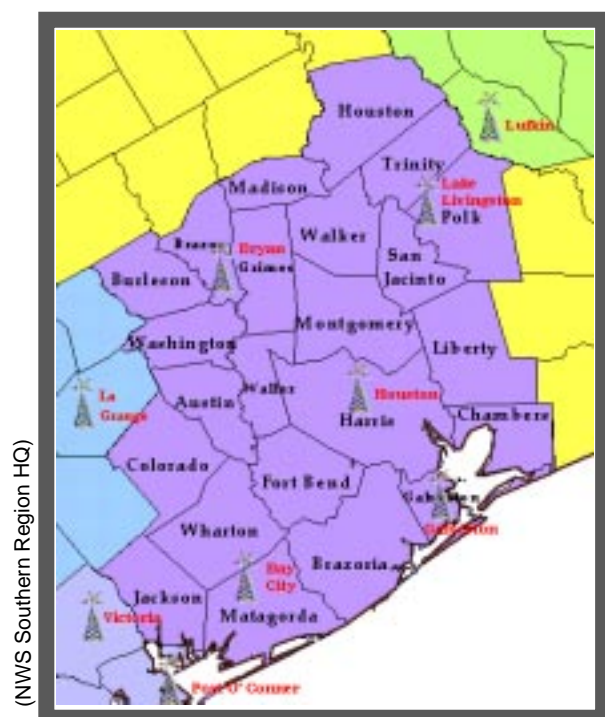
NOAA Weather Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information direct from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day.

Working with the Federal Communications Commission's new Emergency Alert System, NWR is an "all hazards" radio network, making it the single source for the most comprehensive weather and emergency information available to the public. NWR now broadcasts warning and post-event information for all types of hazards - both natural (such as earthquakes and volcano activity) and technological (such as chemical releases or oil spills).

Known as the "Voice of the National Weather Service," NWR is provided as a public service by the Department of Commerce's National Oceanic & Atmospheric Administration. The NWR network has more than 480 transmitters, covering the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. NWR requires a special radio receiver or scanner capable of picking up the signal. Broadcasts are found in the public service band between 162.400 and 162.550 megahertz (MHz).



NOAA WEATHER RADIO



(NWS Southern Region HQ)

### What types of NOAA Weather Radio receivers are available?

NOAA Weather Radio receivers come in many sizes and with a variety of functions. Many radios can receive an alarm tone, triggered when the NWS issues severe weather announcements or emergency information. Most NOAA Weather Radio receivers are either battery-operated portables or AC-powered desktop models with battery backup, so they can be used in many different situations. Some CB radios, scanners, short wave and AM/FM radios are also capable of receiving NWR transmissions.



## FIPS Codes

The National Weather Service uses several different codes to identify counties during varying weather events. One such code, FIPS Codes, helps identify specific states and counties during severe weather events. When combined with a specific event such as a severe thunderstorm or tornado warning, the FIPS Code will identify which state and county the warning affects. For example, when we here at the National Weather Service issue a tornado warning for Montgomery County, the FIPS Codes would follow as: 048339. The 048 part of the code signals to the public that this product refers to a county in the State of Texas, with the 339 part of the code specifically identifying Montgomery County. If you put it in a handy reference manual and you know the state identifier and the list of county identifiers, you can pinpoint any county in the United States without reading the text. This code helps computer programmers with television, radio, private companies, and the National Weather Service automatically monitor severe weather warnings and statements to better serve the public.

**NWS Houston/Galveston NOAA Weather Radio Area FIPS Codes**

COUNTY	FIPS CODE	COUNTY	FIPS CODE
Austin	048015	Madison	048313
Brazos	048041	Milam	048331
Brazoria	048039	Montgomery	048339
Burleson	048051	Polk	048373
Chambers	048071	Robertson	048395
Fort Bend	048157	San Jacinto	048407
Galveston	048167	Trinity	048455
Grimes	048185	Walker	048471
Harris	048201	Waller	048473
Leon	048289	Washington	048477
Liberty	048291	Wharton	048481
Matagorda	048321		





## SKYWARN

### What is SKYWARN?

SKYWARN is a concept developed in the early 1970s that was intended to promote a cooperative effort between the National Weather Service and communities. The emphasis of the effort is often focused on the storm spotter, an individual who takes a position near their community and reports wind gusts, hail size, rainfall, and cloud formations that could signal a developing tornado. Another part of SKYWARN is the receipt and effective distribution of National Weather Service information.



Skywarn is a program sponsored by your National Weather Service Office in conjunction with your local Emergency Management Organization. It is a group of trained volunteers that watch the skies during severe weather and relay reports back to you local Emergency Management Official and/or the National Weather Service (NWS). These volunteers provide valuable information to help the NWS save lives and reduce property damage in your community by improving warnings.

### How do I join SKYWARN?



(NWS Little Rock)

Each NWS office around the country is the primary point of contact for each local SKYWARN program. If you or your community is interested in sponsoring a Skywarn Program, contact your local NWS office to schedule a training session. The Houston/Galveston National Weather Service conducts most Skywarn classes during the months of January, February and March before the spring severe weather season peaks in April and May. These training sessions last around 3 hours and can be scheduled during the day, in the evening or even on Saturday to fit your schedule. For further information on particular programs, please contact Gene Hafele at 281.337.5074 or listen to NOAA Weather Radio in your area for information on these programs as they come closer.

### For more SKYWARN information:

National SKYWARN	<a href="http://www.skywarn.org/">http://www.skywarn.org/</a>
Texas SKYWARN	<a href="http://www.skywarn-texas.org/">http://www.skywarn-texas.org/</a>
East Texas SKYWARN	<a href="http://www.stormwarn.net/">http://www.stormwarn.net/</a>
Clear Lake SKYWARN	<a href="http://home.houston.rr.com/kd5aom">http://home.houston.rr.com/kd5aom</a>

SKYWARN



## Severe Weather Awareness Week Statement Schedule

During each day of Severe Weather Awareness Week, special releases will be made by the National Weather Service each weekday morning and afternoon to further emphasize important information about severe weather and the National Weather Service's mission in protecting life and property. These messages will discuss many facets of the schedule of severe weather, along with the recommended safety rules. The schedule of these releases is listed below. Newspapers and safety organizations can help by reprinting these safety rules. Radio and television personnel can help make sure this information gets to the public.

DAY	SUBJECT
Sun, Feb 29th	Introduction , Watch/Warning System and Terms
Mon, March 1st	NOAA Weather Radio/S.A.M.E., Hail
Tue, March 2nd	Tornadoes, Downbursts
Wed, March 3rd	River Flooding, Flash Flooding
Thu, March 4th	The SKYWARN Program, Preparedness
Fri, March 5th	Safety After the Storm, NWS Phone Numbers/Internet Sites

Important Contact Information		
National Weather Service Houston/Galveston 1620 Gill Road Dickinson, TX 77539 281.337.5074 <a href="http://www.srh.noaa.gov/hgx">www.srh.noaa.gov/hgx</a>		
<b>Phone Numbers/E-mail Addresses:</b>		
Meteorologist-In-Charge, Bill Read	x222	<a href="mailto:bill.read@noaa.gov">bill.read@noaa.gov</a>
Warning Coordination Meteorologist, Gene Hafele	x223	<a href="mailto:gene.hafele@noaa.gov">gene.hafele@noaa.gov</a>
Service Hydrologist, Dave Schwertz	x228	<a href="mailto:dave.schwertz@noaa.gov">dave.schwertz@noaa.gov</a>
Information Requests/Forecasts	x229	<a href="mailto:sr-hgx.nws@noaa.gov">sr-hgx.nws@noaa.gov</a>
<b>Internet Addresses:</b>		
State of Texas Division of Emergency Management	<a href="http://www.txdps.state.tx.us/dem">http://www.txdps.state.tx.us/dem</a>	
Federal Emergency Management Agency (FEMA)	<a href="http://www.fema.gov">http://www.fema.gov</a>	
Storm Prediction Center	<a href="http://www.spc.noaa.gov">http://www.spc.noaa.gov</a>	
Texas SKYWARN Page	<a href="http://www.skywarn-texas.org">http://www.skywarn-texas.org</a>	
National Climatic Data Center	<a href="http://www.ncdc.noaa.gov/oa/ncdc.html">http://www.ncdc.noaa.gov/oa/ncdc.html</a>	
EMWIN Houston	<a href="http://houston.emwin.org/">http://houston.emwin.org/</a>	